

REMARKS

(1) Claims 1-13 and 17-19 are pending in this application after the entry of this amendment. Claims 14-16 are canceled. Reconsideration of rejections in view of these amendments and the following remarks is respectfully requested.

(2) Claim Objections

The grammatical errors in Claim 1 pointed out by the examiner are corrected by the amendments. The objections are believed to be overcome.

(3) Rejection under 35 USC 112, second paragraph

Claims 5-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner alleges that the use of a phrase "to be subjected" in claims 5-13, line 3, is indefinite, and it is unclear that the making step is during or after the formation of the solder resist. The Examiner also alleges that the limitation "the marking ink" recited in claims 8-13 has insufficient antecedent basis.

The rejection in these respects are believed to be overcome by the present amendment.

(4) Rejection under 35 USC 103(a)

Claims 1-2, 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schmidt et al (U.S. 5,134,056) in view of Kono et al (U.S. 6,346,678).

Reconsideration and removal of the rejection is respectfully requested in view of the present amendments to the claims and the following remarks.

Schmidt et al disclose a method of manufacturing a printed circuit board, having conductive interconnects 2, plated through holes 3 and solder pads 4 applied as portions of a printed conductor pattern formed on a surface of a board (col. 2, lines 61-65 and figure 1).

Schmidt et al also disclose that after the application of the solder resist 5, a positively-acting photoresist 6 is applied over the entire surface of the solder resist 5 as shown in Fig.3 (column 3, lines 16-19), and the photoresist 6 is subsequently exposed in the regions of the plated-through holes 3 and of the solder pads 4 with the assistance of a laser in a scan method(column 3, lines 28-31). Then, the exposed regions of the photoresist 6 are seen as blackening(column 3, lines 36-37).

Kono et al disclose a method of forming the conductor patterns on a board using a laser beam.

However, the regions 60 of the photoresist 6 that have become soluble due to the exposure disclosed by Schmidt et al are removed (column 3, lines 40-42, figures 4-5). In this respect, the present invention is different from Schmidt et al. As illustrated in Fig 12 of the present invention, the photosensitive film 23 is irradiated by a laser beam in the region above the conductor 21(FIG.12 (c)), and then, ultraviolet rays are irradiated without removing the exposed portion 23a of the photosensitive film, resulting in omitting some steps and reducing cost according to the present invention.

The present invention is distinct from the prior art because the solder resist material is

irradiated by ultraviolet rays through a portion 23 of the photosensitive film, where a laser beam is not irradiate, "through a portion of the photosensitive film not irradiated by the laser beam" as now provided in amended Claim 1.

Claims 3-4 are rejected further in view of Ohsumi et al (U.S. 6,001,537). Claims 5-13 are rejected further in view of Shinmoto et al (U.S. 5,897,934).

These additional references do not correct the deficiencies of Schmidt et al and these dependent Claims 3-13 are also believed to be patentable.

In view of the present amendments to the claims and the above remarks, Claims 1-19 are believed to be patentable and early allowance thereof is respectfully requested.


If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Version with markings to show changes made



VERSION WITH MARKINGS TO SHOW CHANGES MADE 09/713,036

IN THE CLAIMS:

Claims 14-16 have been canceled.

Claims 1 and 5-13 have been amended as follows:

1. A method of manufacturing a multi-layer printed wiring board comprising an internal layer circuit forming step, [a] an outer layer circuit forming step, and a solder resist forming step,

wherein the internal layer circuit forming step and the outer layer circuit forming step comprise steps of:

providing a board coated with a patterning material;

coating the surface of [a board coated with a] the patterning material with a photosensitive film;

exposing the photosensitive film according to a predetermined conductive pattern;

forming an etching resist by removing a portion of the photosensitive film which is not exposed from the board;

removing the patterning material from the board according to the etching resist; and

removing the etching resist from the board, and

the solder resist forming step comprises steps of:

coating the surface of the board subjected to the outer layer circuit forming step with a photosensitive solder resist material;

coating the solder resist material with a photosensitive film;

forming a light shielding mask by irradiating a laser beam on the photosensitive film according to a formed pattern of the solder resist;

exposing the solder resist material [by using the light shielding mask] through a portion of the photosensitive film not irradiated by the laser beam;

removing the light shielding mask; and

removing the solder resist material which is not exposed due to the light shielding mask.

5. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 1, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface₁ [subjected to] after the solder resist forming step₁ with a photosensitive marking material;

coating the marking material with a photosensitive film;

forming a light shielding mask by irradiating a laser beam on the marking material according to marked information;

exposing the marking material by using the light shielding mask;

removing the light shielding mask; and

removing the marking material which is not exposed due to the light shielding mask.

6. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 2, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface₁ [subjected to] after the solder resist forming step₁ with a photosensitive marking material;

coating the marking material with a photosensitive film;

forming a light shielding mask by irradiating a laser beam on the marking material according to marked information;
exposing the marking material by using the light shielding mask;
removing the light shielding mask; and
removing the marking material which is not exposed due to the light shielding mask.

7. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 3, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface, [subjected to] after the solder resist forming step, with a photosensitive marking material;
coating the marking material with a photosensitive film;
forming a light shielding mask by irradiating a laser beam on the marking material according to marked information;
exposing the marking material by using the light shielding mask;
removing the light shielding mask; and
removing the marking material which is not exposed due to the light shielding mask.

8. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 1, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface, [subjected to] after the solder resist forming step, with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and
removing the marking [ink] material except for the marking [ink] material on a portion where the
marking [ink] material is hardened by irradiation of the laser beam.

9. (Amended) A method of manufacturing a multi-layer printed wiring board according to
claim 2, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface₁ [subjected to]
after the solder resist forming step₁ with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and
removing the marking [ink] material except for the marking [ink] material on a portion where
the marking [ink] material is hardened by irradiation of the laser beam.

10. (Amended) A method of manufacturing a multi-layer printed wiring board according
to claim 3, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface₁ [subjected to]
after the solder resist forming step₁ with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and
removing the marking [ink] material except for the marking [ink] material on a portion
where the marking [ink] material is hardened by irradiation of the laser beam.

11. (Amended) A method of manufacturing a multi-layer printed wiring board according

to claim 1, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface, [subjected to] after the solder resist forming step, with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and

removing the marking [ink] material except for the marking [ink] material on a portion where the marking [ink] material is softened by irradiation of the laser beam.

12. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 2, further comprising a marking step comprising steps of:

coating a marking position [to be subjected to marking] on a board surface, [subjected to] after the solder resist forming step, with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and
removing the marking [ink] material except for the marking [ink] material on a portion where the marking [ink] material is softened by irradiation of the laser beam.

13. (Amended) A method of manufacturing a multi-layer printed wiring board according to claim 3, further comprising a marking step comprising steps of:

coating a marking coating position [to be subjected to marking] on a board surface, [subjected to] after the solder resist forming step, with a photosensitive marking material;

irradiating a laser beam on the marking material according to marked information; and
removing the marking [ink] material except for the marking [ink] material on a portion where the marking [ink] material is softened by irradiation of the laser beam.